GRINNELL

FOUNDED 1850

THERMOLIER

THERMOLIER

THE GRINNELL UNIT HEATER with 14 POINTS of SUPERIORITY

This booklet seeks to outline the salient features of Unit Heating and explains how this principle of heating successfully meets all of the fundamental considerations governing the choice of a heating system for factory buildings, industrial buildings and various types of commercial structures.

It also describes how this superior method of heating can be economically and efficiently utilized in its wide range of applications through the use of Thermolier—the Grinnell Unit Heater—which has structural features backed by over 50 years of heating experience and designed to meet the most rigid requirements in the heating field.

GRINNELL COMPANY INC.

EXECUTIVE OFFICES

PROVIDENCE • RHODE ISLAND

For Sales Offices, Branches and Plants, See Inside Back Cover

UNIT HEATING

For Comfort and Economy

THE fundamental consideration in all heating is comfort, because comfort means efficiency of employees, which in turn means more production and profits.

Comfort in heating, in the last analysis, means unawareness of the fact that there is any heating. To obtain such comfort you must have just the heat you want when and where you want it. It means that you must have more heat on cold days and less heat on mild days. It means comfort, regardless of outside temperature or interior conditions.

There are five basic factors which must be considered in the selection of a heating system for industrial and commercial applications. They are as follows:

1. UNIFORMITY OF DISTRIBUTION

This is the most important factor of all because not only does uniformity of distribution largely determine the operating efficiency of a heating system but also the comfort of occupants or employees.

2. ADAPTABILITY

The ability of the system to fit into the building conditions and the space which can economically and easily be allotted for such equipment is of utmost importance. The system must take care of individual requirements, such as the need for one temperature condition at one point and another condition at an adjacent or perhaps a far remote point.

3. ECONOMY OF OPERATION

The type of heating system which will operate most economically is the one which will meet the variations of outside temperatures and winds with the greatest exactitude.

4. ECONOMY IN FIRST COST

Consistent with operating results, first cost must always be a determining factor in choosing a heating system.

5. DEPRECIATION AND MAINTENANCE

Cost does not end with first cost alone. The whole answer to cost cannot be calculated until the relative depreciation and maintenance expense of the system is taken into consideration. The total cost at the end of 5, 10 or 20 years must be considered.

The underlying principle in unit heating is to heat a large volume of air in a small compact piece of apparatus and then distribute the air by fans to locations where it is usable.

The particular type of unit heating described in this booklet may be called the OVERHEAD type. In this system a number of small light weight highly efficient units are located overhead and the heated air is distributed both horizontally and downward, either constantly or intermittently, and controlled either automatically or manually as best fits the individual requirements.

How this overhead type of unit heating meets these five basic factors for every industrial and commercial application in a superior manner is explained in the following pages.

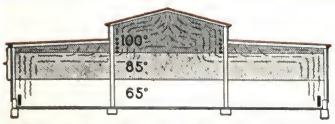
ADVANTAGES OF UNIT HEATING

● UNIT HEATING IS UNIFORM

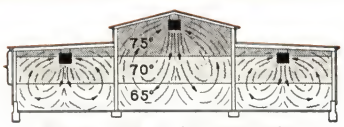
With old fashioned heating systems, the natural air circulation makes the ceiling temperature excessively high. There is no way to get the heat down into the area where it is wanted and needed.

Unit heaters insure a more even distribution of heat throughout the entire area over which they are suspended. They mechanically force the heat downward and keep it there. Although small and compact, the units have a large heating capacity and only a few of them are required to quickly and uniformly heat a large area.

This even inside temperature may easily be maintained, regardless of the distance of the units from the heating source or of changes in outside temperature, because of the flexibility of the automatic control of the units. Should cold air enter the room through the opening of doors or windows, the nearest units automatically start and



Uneven Heat Distribution with Old Fashioned System



Even Heat Distribution with Overhead Unit Heating

direct more heat to the cooled area. Immediately the desired temperature is reached, the units automatically shut off until more heat is again called for by the thermostat.

● UNIT HEATING IS HEALTHFUL

The steady even temperatures maintained by unit heaters insure more comfortable and healthful working conditions for employees. With obsolete heating systems, hot pipe coils running around side walls, or bulky radiators make nearby areas too warm for human comfort. Distant sections of the room are often too cold for efficiency in workmanship.

With unit heaters suspended overhead, the warmed air is gently directed downward, stagnant air is broken up and more healthful conditions prevail. In fact, there is an unawareness that there is any heating. Naturally, the general health of employees is enhanced, absence due to colds and sickness is reduced and improved working conditions result in increased production.

● UNIT HEATING MEETS INDIVIDUAL REQUIREMENTS

Quite frequently it is imperative to maintain different temperatures in certain rooms or areas. There are also times when only a section of a large room may be in use and heating the entire room is not only unnecessary, but it proves costly. In such instances and in similar ones, unit heating is ideal because its adaptability and its flexibility of operation easily enable it to meet such requirements quickly, economically and efficiently.

In other words, unit heating is heating which is readily "tailored to fit" the needs of the moment. Its automatic or manual control easily allows maximum, partial, intermittent or "spot" heating in any area. This is accomplished by the number of units operating, the speed at which they are running and the direction in which the heat is being distributed. Installations vary, anywhere from one unit being used in an isolated section of a building to several hundred being employed to heat an entire plant.

● UNIT HEATING IS ADAPTABLE

With unit heaters, industry has found the most "adaptable" method of heating ever known. The simplicity of the piping and the feasibility of hanging heaters from the ceiling, supporting them on columns, or suspending them from beams, has resulted in adequate heating without interfering with the comfort of operatives or the most economical arrangement of operating machinery and equipment. Unit heaters are so easily installed that they are practically portable, allowing changes to be made at any time plant conditions so dictate.

With a system of unit heating, the piping may be installed to fit plant conditions and processes. Because the units are best placed as high overhead as practical, both the supply and return piping may also be well up out of the way, and the trouble attendant to burying return piping as in old fashioned systems is entirely eliminated. Not only is this feature of "adaptability" of prime importance in new buildings, but it is of even greater importance in existing buildings, because it often allows antiquated and unsatisfactory systems to be modernized and revamped at exceedingly small cost.

UNIT HEATING IS ECONOMICAL

The use of a reasonable number and size of overhead units is essential for uniform distribution and thereby moderate velocities of air discharge are permitted to insure comfort. These requisites considered, there is no type of heating system so economical to install as the type advocated in this booklet. This is due to the following facts:

1. The heating surface is so efficient and compact that one unit heater, weighing less than 200 pounds and with a frontal area of approximately four square feet, will take the place of more than two tons of cast-iron radiation or an equivalent amount of pipe coil heating surface. This in itself represents a saving of nearly one-half in the cost of radiating elements.
2. An even greater saving is made in the labor of installing this heating surface. Even when the cost of electrical connections to unit heaters is taken into account, the saving in cost of the heating elements installed is substantial.
3. A very much smaller amount of pipe fittings and accessories is required to convey steam to the units and to convey condensation from the units back to the source of supply with unit heaters than with direct steam systems.
4. A proportionally less amount of labor is necessary for installing this small amount of supply and return piping and accessory material.
5. Increased fuel savings result from the fact that with this overhead type of unit heating, the heated air which rises to the ceiling when the units have temporarily stopped operating, is again utilized when the units automatically start and force it downward again, quickly heating the area to the desired temperature.

Exceptional Adaptability of Thermoliers During Subzero Construction

With an average outside temperature of 2° above zero and, at times, 28° below zero, Grinnell Thermoliers, operating continuously for a month, were used to temporarily heat and to cure concrete in this structure. Tarpaulin was the only enclosing medium

● OPERATING COST IS LOWER

In addition to its low first cost, a unit heating system is most economical to operate. Behind everything in heating expense is outside temperature. If the thermometer would go down to zero and stay there for four or five months, heating expense for almost any adequate type of system would be about the same. But, the outside temperature is very erratic and is constantly changing. The real test of any heating system is, therefore, to maintain an even temperature inside regardless of the changing temperature outside.

This is where the overhead type of unit heating constantly forcing the heated air down where it is needed functions so admirably. Heat is turned on or off merely by throwing a switch manually, or more exactly, by a simple automatic control governed by room temperature. Consequently, heat is only furnished when and where it is needed and no heat is wasted. Substantial fuel savings are the result.

● MAINTENANCE EXPENSE DECREASED

The simplicity of the unit heating system obviously makes it an easy and economical system to maintain. There is much less piping in the system, there are fewer joints, and there are fewer valves, traps and specialties. The presence of all of these items in direct steam systems tends to increase maintenance expense. The only possible item in the unit heating system which could make for higher maintenance expense than in the direct system, is the heater itself, with its accompanying motor and fan. This factor is of vital importance in choosing the particular type of heater for your plant. In making such choice, engineers and owners should consider carefully the merits of the units selected as regards design, construction and practicability for dependable performance.

● DEPRECIATION IS MINIMIZED

Depreciation in direct steam systems is chiefly due to corrosion and expansion and contraction strains of the pipe lines brought about by the fact that steam is alternately off and on in the lines. With the unit heater system, there is a much smaller number of lines to be considered, and, furthermore, steam is practically always in the lines, which tends to reduce pipe depreciation to a negligible quantity.

As far as depreciation of the units themselves is concerned, this is essentially a matter of proper selection of materials and their proper assembly into the type of unit which is durable beyond question. In the unit heater to be described, these factors have had earnest consideration, resulting in a unit which is built to last indefinitely as proven by experience.

THERMOLIER

THE GRINNELL UNIT HEATER

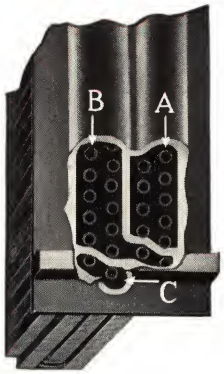
From the foregoing it is seen that the principle of overhead unit heating absolutely meets the basic considerations governing the choice of a heating system. The next step, which is of paramount importance, is to select just the right type of unit heaters produced to render this sound principle lastingly effective and thoroughly practical in all its applications.

In offering Thermolier, Grinnell Company, Inc., places at the disposal of architects, engineers and owners, a quality unit heater so conservatively engineered and ruggedly built that it makes the principle of unit heating more effective and more successful over a wide field of practical applications. It is backed by an experience of over 50 years with all types of heating systems in all types of buildings. Thousands of installations throughout the country attest to its efficiency and dependable performance.

As a result of that practical experience and specialized knowledge in heating, there have been built into Thermolier, fourteen engineering and structural features which should insure the utmost confidence to those concerned with adapting the principle of unit heating to their own particular problems. For their consideration, these fourteen features are clearly described and illustrated on the following pages.

THERMOLIER has these 14 POINTS OF SUPERIORITY

1 INTERNAL COOLING LEG ASSURES CONTINUOUS REMOVAL OF CONDENSATION (Exclusive with Thermolier)



Due to the exceptional construction of the header in Thermolier, steam circulation and the removal of condensation in this unit are distinctly different than is usual in unit heaters. This most unique feature is so simple, practical and valuable that engineers and contractors alike are quick to realize its importance.

Steam is delivered into Chamber "A" of the header and circulates from there through the pitched U tubes, carrying its condensation with it into Chamber "B." By partitioning off the lower tube or tubes at the bottom of the Steam Supply Chamber "A" these tubes carry all condensation from Chamber "B" into Drain Chamber "C." In passage of this condensation through these tubes, the air from the fan is rapidly carrying off heat just as it does in the rest of the unit. The result is that these two bottom tubes form an efficient internal cooling leg, integral with the unit.

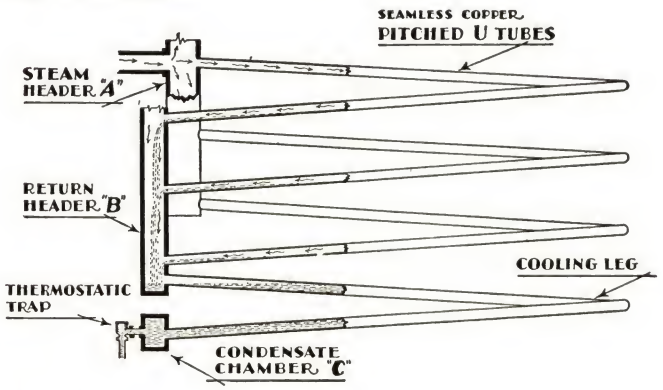
The actual cooling effect of this construction is equal to a run of more than 100 feet of the ordinary, exterior cooling leg piping.

THERMOSTATIC TRAPS OPERATE PERFECTLY WITH THERMOLIER

The Internal Cooling Leg in Thermolier makes it practical to use a thermostatic trap—the simplest of all traps—with every size and model. During operation of the unit, the internal cooling leg keeps such a trap partially or fully open at all times. As the number of openings and closings of the trap is greatly reduced, being only a fraction of those required in normal use under other conditions, the life of the thermostatic trap or valve is greatly prolonged.

The use of such a valve or trap lowers installation costs, not only because the trap is less expensive than other types but because the piping connections are less complicated. In addition to the above advantages, a much neater and compact installation is insured. Thermolier, operating under such conditions will maintain its full efficiency indefinitely.

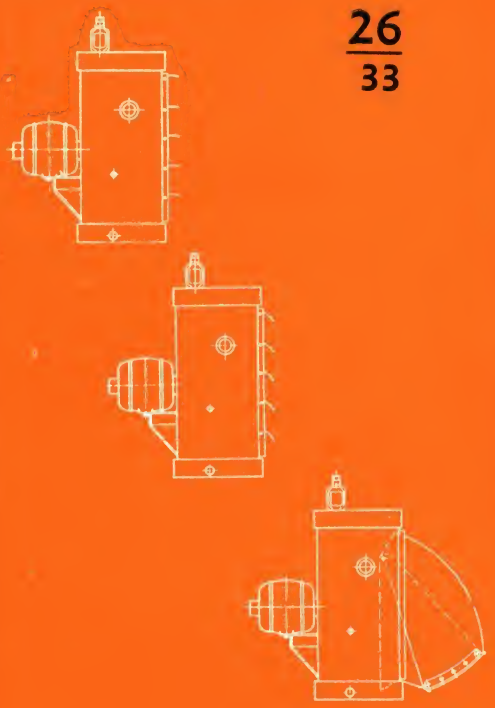
As the internal cooling leg acts, to a certain extent, as a vacuum condenser, drawing steam through and discharging condensation with air continually, the unit does not "air bind." Another important feature is the fact that the heating element, draining continually instead of intermittently, is not subjected to frequent changes in temperature. The life of the entire unit is, therefore, greatly prolonged because of the internal cooling leg and its various contributing advantages.



2 EVERY TUBE AN EXPANSION BEND

Every tube in Thermolier is of the "U" or hairpin type to allow for variation in contraction and expansion of the various tubes made into a single header at one end. While this method of construction is expensive because it increases the cost of symmetrically housing the unit, experience with hundreds of thousands of these tubes built into Thermolier has shown it is the most effective and practical means of compensating for varying expansion strains. It also adds greatly to the absolute dependability of the unit over long periods of time.

At left are shown one each of the various tubes used in the assembly of the heating units in the various models of Thermolier. All tubes are of the same construction, the only difference being in their length and diameter.



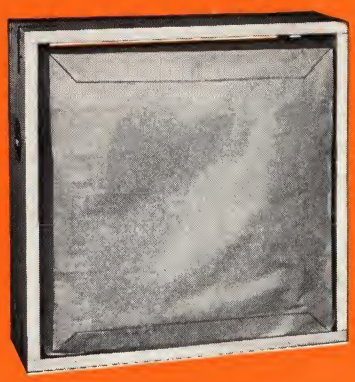
3 VELOCITY MEETS WIDE RANGE OF REQUIREMENTS

Getting the heated air to the area where it is wanted is primarily a function of outlet or nozzle velocity combined with a suitable directing device. Thermolier is provided with means for maintaining practically any velocity discharge to meet requirements.

The louvers of Thermolier, like its other parts, are designed to last indefinitely. These louvers are provided simply to direct the air flow in the direction required and each louver may be adjusted independently of the other. The louvers may be raised or lowered, as desired, to produce required direction of air. The louvers are so mounted as to remain permanently where set.

If buildings are of an unusual height, Thermoliers may be equipped with Velocity Nozzles. Velocity Nozzles are adjustable for medium to maximum velocity of discharge. They are furnished in the same materials and finish as the units and present a neat, attractive appearance.

4 FACTORY PACKED FOR EASY INSTALLATION



The ease with which Thermolier can be installed is, in a great measure, due to the unique manner in which it is packed before leaving the factory.

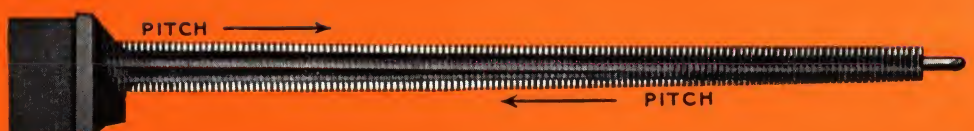
The unit itself is first enclosed in a heavy paper bag to protect its finish from marring and soiling during erection. It is then neatly packed in a specially designed, rugged wood frame with removable couplings. These frames are furnished on all of the larger models of Thermolier and greatly facilitate handling and hoisting into place without damage.

The simple instruction sheet accompanying it shows how the unit can be quickly suspended with the Grinnell Adjustable Swivel Couplings (described in Point 11), the frame easily removed and the piping connections made. If new construction or remodeling is in progress, the bag may be left in place to protect the neat appearance of the unit until it is ready for operation.

5 POSITIVE BUILT-IN DRAINAGE

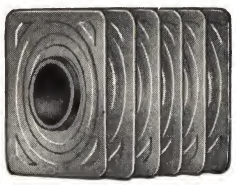
Below is an individual section cut out of a complete Thermolier heating element to show the pitch of each tube is definitely built-in and insured. This pronounced pitch provides positive and complete drainage of condensation from each individual tube, thus increasing heating efficiency and doing away with the possibility of noisy and destructive water hammer on account of accumulated condensation.

At the right is shown the assembly of the complete heating element. The pitched finned tubes are built into the header at the further end. The pitch is permanently maintained at the "U" end by the strong spring clips which clamp each bend into definite alignment and at the same time allows for contraction and expansion strains.



6 SUPERIOR HEATING ELEMENT INSURES LONG LIFE

The steam container in the heating element of Thermolier is made of seamless copper tubing, which has a great factor of safety in strength as against any practical operating conditions. Stamped square brass or copper fins, slightly corrugated for stiffness, are attached uniformly to this tubing by automatic machinery. Square fins provide 24% more radiating surface than round fins occupying the same space. This accounts in no small degree for the large amount of heat obtained from the small frontal area of Thermolier.



No solder whatever is used for strength in Thermolier assembly. The deep, tight fitting collars on the fins provide ample support and large metal contacts for rapid heat transfer from tubes to fins. Collars also provide uniform spacing. The final immersion of the tube and fin assembly in a solder bath is only for the purpose of establishing a permanent metal bond between fins and tubes and is not a strength factor.

7 TUBE TO HEADER CONSTRUCTION LEAK PROOF

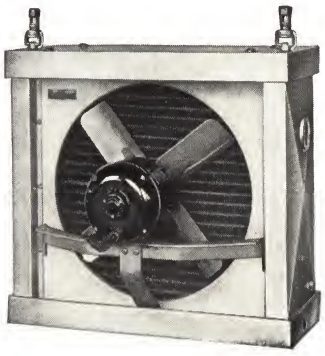
Years of experience with the method used in expanding the copper tubes into the cast iron header prove it insures the best possible type of a joint. More than a half million of these expanded joints in Thermoliers are in actual service and, with not a single failure under the operating conditions for which they are intended, their record stands as positive proof of this statement.

This method of header construction has been almost exclusively used for many years in the construction of condensers, heat exchangers and other important apparatus for power plant and process work. Obviously, therefore, with this construction the steam pressures which the heating element of Thermolier will withstand are limited only by the weight of the cast iron header. The standard unit is built for 125 lbs. working steam pressure and may be used with complete confidence in the safety and durability for such pressures.

8 MOTOR AND FANS MEET SPECIFIC THERMOLIER REQUIREMENTS

The motors on Thermoliers are not standard stock size motors, but are built to exacting specifications to insure each unit to operate at its highest efficiency with the minimum of electrical input. They are fully enclosed to keep out dirt and moisture. The care exercised in producing these special motors insures long service with a definite saving in power cost.

The fans have aluminum blades with a special steel hub and are made to very exacting specifications and tolerance to insure perfect balance, minimizing vibration and noise. They are attached to the motor shaft by a specially developed locking device which has absolutely eliminated the possibility of their coming loose. The mounting for motor and fan is a heavy angle iron bracket, reinforced by a sturdy, supporting brace.



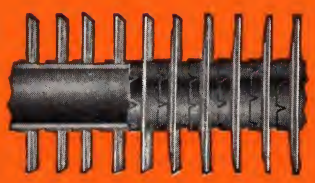
9 HEAVY FRAME GIVES GREATER RIGIDITY

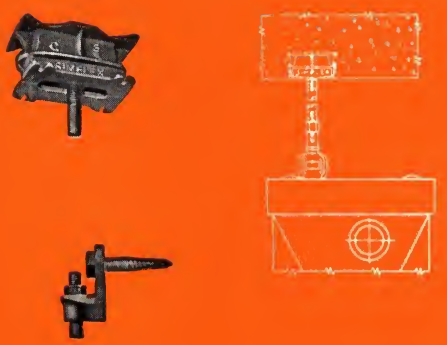
Realizing that the frame is the backbone of the completed assembly, a design in which strength was the fundamental consideration was adopted for Thermolier. The heavy hanger rods extend through and become an integral part of the completed frame.

Special attention is directed to the form of the frame, which is so made that the outside copper or Ducoed steel housing covers and protects it closely and tightly from moisture and other corrosive agencies.

10 TUBE DESIGN MINIMIZES DIRT COLLECTION

The heating element in Thermolier is especially designed to reduce the possibility of dirt collection to an absolute minimum. There is absolutely no flat horizontal heating surface in the unit. This minimizing of the possibility of dirt collection is important because the deposit of dirt particles on flat surfaces tends in time to seriously decrease the efficiency of such a heating element even if it does not eventually seriously interfere with the air flow through the unit. Of the total heating surface, 89% is provided in vertical fins and the remaining 11% of the heating surface consists of the round, horizontal tubes. It is obvious that this type of construction offers no place for dirt or dust to rest or accumulate.





11 ADJUSTABLE HANGERS FACILITATE ERECTION

The Grinnell "Adjustable Swivel Coupling" was especially developed to provide a standard method of hanging Thermoliers. This hanger, when screwed on, is an integral part of each unit. The swivel is loose in the socket and is self-locking so that once the hanger rods are adjusted, they are automatically locked in position. This allows vibration from building or machinery to be taken up in the hanger and not transmitted to the unit.

Several methods by which Thermolier, with its Adjustable Swivel Couplings may readily be attached to various types of building construction, are indicated here.

The full line of adjustable hangers which may be utilized in connection with this special Swivel Coupling is shown in Grinnell Hanger Catalog 8. This Catalog will be sent upon request.

12 SIMPLE PIPING CONNECTIONS

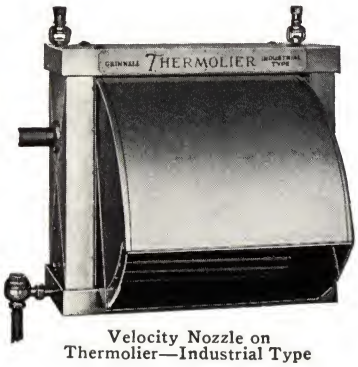
The efficient functioning of the internal cooling leg in Thermolier permits and actually requires that a thermostatic trap be connected directly to the return outlet opening. The condensation coming from the unit is cool enough so that the thermostatic trap will operate continuously even when the unit is working at maximum capacity for indefinite periods. This feature, combined with the fact that the steam supply connection is at the same end of the unit, makes for compactness, neatness and economy in the piping connections.

13 ATTRACTIVE APPEARANCE

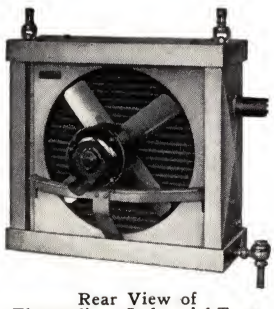
Thermolier presents a neat, attractive appearance and its finishes permit a choice to meet individual requirements. The Industrial Type is available with a non-corrosive, polished copper or chrome plated housing and is adaptable to commercial buildings, manufacturing buildings, factory offices, stores, etc., where the best in appearance is desired.

Where appearance is not of primary importance, Thermolier — Factory Type — is available with a rugged steel housing, finished in gray Duco. It is adaptable where a substantial but not elaborate appearance is required and is less likely to be marred during handling or after installation.

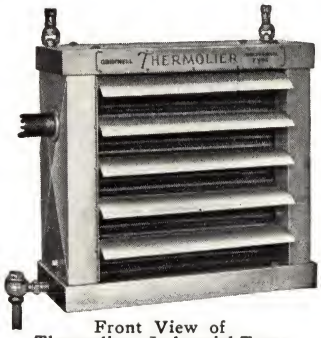
Velocity Nozzles have the same finish as the units to which they are attached.



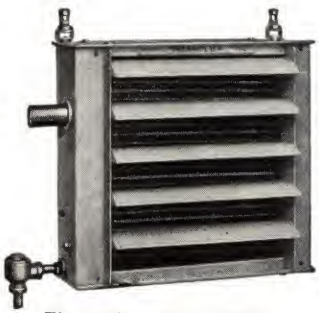
Velocity Nozzle on Thermolier—Industrial Type



Rear View of Thermolier—Industrial Type



Front View of Thermolier—Industrial Type



Thermolier—Factory Type

14 30 SIZES TO MEET YOUR EVERY REQUIREMENT

The wide range of sizes which compose the complete line of Thermoliers includes 30 sizes from which just the right type for any space or condition may be readily selected. Thousands of installations throughout the country attest to their efficiency and dependable performance, anywhere from one unit having been used to correct an unsatisfactory heating condition in an isolated section of a building, to installations of several hundred units employed to heat an entire plant.

While this type of heating is comparatively simple to lay out there are certain methods of placing Thermoliers with reference to exposures, drafts and working conditions, which greatly increase the efficiency and comfort to be obtained from them. Grinnell Company, Inc., places at your disposal half a century of experience in industrial heating and a request to any of its sales offices in all principal cities will receive prompt attention.

Thermolier—Industrial Type

Thermolier—Industrial Type with Velocity Nozzle

Thermolier—Factory Type

Thermolier — Factory Type with Velocity Nozzle

TYPES and MODELS

INDUSTRIAL TYPE

AVAILABLE with polished copper or chrome plated housing. Suitable for use in mercantile buildings, manufacturing buildings, factory offices, stores, etc., where the best in appearance is desired.

Velocity nozzles have same finish as units to which they are attached.

Made in all Models listed.

FACTORY TYPE

AVAILABLE with steel housing, gray Duco finish. For use where the appearance is not of paramount importance. Appearance very substantial but not elaborate.

Velocity nozzles have same finish as units to which they are attached.

Made in all Models listed.

READY REFERENCE FOR IDENTIFICATION OF OLD AND NEW MODEL NUMBERS

Due to the fact that we have added a considerable number of sizes to our line since original model numbers were adopted, we have found it desirable to renumber all models. The following table is for ready identification of old and new model numbers. On each capacity page will be found the new as well as the old numbers.

New	20	25	30	40	45	50	60	65	70	80	90	100	110	140	180
Old	....	....	....	400A	....	400B	400	....	....	800B	800	1600A	....	1600B	1600
New	20L	25L	30L	40L	45L	50L	60L	65L	70L	80L	90L	100L	110L	140L	180L
Old	....	....	....	300A	....	300B	300	....	....	600B	600	1200A	....	1200B	1200

26
33

CONDENSED CAPACITIES

WHEN THERMOLIER IS RUN AT NORMAL SPEEDS

All based on Standard Basis of Rating: 2 lbs. Steam Pressure and 60° Entering Air Temperature.

Note: For Capacities at other Pressures and Temperatures, see Conversion Table on opposite page.

Model Number	R. P. M. at Normal Speeds	Total heat delivered B.t.u. per hr.	Equivalent Direct Radiation E. D. R.	Air delivery cu. ft. per min.	Exit air temp. °Fahr.	Condensation lb. per hr.	Air Velocity at Exit—Linear Ft. per Min.		
							Louvers Wide Open	Louvers Set at 45°	Velocity Nozzle Max.
20	1750	35,000	146	646	114	35	743	928	1337
20L	1150	26,900	112	438	122	28	505	632	908
25	1750	40,500	169	685	120	42	787	983	1415
25L	1150	30,900	128	475	127	32	546	682	981
30	1750	47,800	199	579	147	49	666	832	1198
30L	1150	35,200	147	395	156	37	454	568	818
40	1750	69,400	289	1566	104	72	1039	1402	1870
40L	1150	53,300	222	1030	112	56	682	921	1228
45	1750	81,200	339	1810	105	84	1200	1616	2150
45L	1150	62,600	261	1196	113	66	793	1070	1425
50	1750	90,700	378	1794	111	93	1173	1584	2116
50L	1150	67,100	280	1182	118	70	772	1042	1388
60	1750	104,800	437	1424	137	108	942	1272	1695
60L	1150	77,700	324	938	148	81	620	837	1116
65	1150	129,500	540	2356	115	134	785	1061	1592
65L	850	110,100	459	1792	128	114	597	807	1210
70	1150	142,000	592	2895	109	147	965	1310	1970
70L	850	117,000	490	2160	114	122	720	977	1470
80	1150	164,600	686	2884	117	171	961	1297	1951
80L	850	139,300	580	2180	125	143	727	981	1476
90	1150	189,200	788	2298	144	196	768	1036	1559
90L	850	151,600	632	1702	152	156	569	768	1155
100	1150	234,000	975	5400	103	243	1034	1499	1933
100L	850	196,000	817	4010	108	203	769	1115	1438
110	1150	259,000	1080	6290	101	269	1202	1746	2250
110L	850	211,600	883	4530	106	219	865	1256	1620
140	1150	320,000	1333	6034	113	330	1152	1671	2156
140L	850	271,000	1129	4516	120	280	864	1253	1616
180	1150	368,000	1533	4800	140	379	916	1328	1712
180L	850	294,000	1225	3528	148	304	676	980	1264

CONVERSION TABLE

CONSTANTS FOR DETERMINING THE CAPACITIES OF THERMOLIERS

AT VARIOUS STEAM PRESSURES AND TEMPERATURES OF ENTERING AIR

Based on Steam Pressure of 2 lbs. Gage and 60° Entering Air Temperature

To determine Capacity at any Steam Pressure and Entering Air Temperature, multiply Rated Capacity at 2 lbs. Steam Pressure and 60° Entering Air Temperature by Constant from Table below.

Example: Required to find the Capacity of Model 90 Thermolier at 30 lbs. Steam Pressure and 80° Entering Air Temperature. Multiply Capacity of Model 90 at 2 lbs., 60° (189,200 B.t.u.) by Constant (1.19). 189,200 B.t.u. × 1.19 = 225,148 B.t.u.

Steam Pressure Pounds—Gage	Temperature of Entering Air—Degrees Fahr.											
	—10°	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°
0	1.54	1.45	1.37	1.27	1.19	1.11	1.03	0.96	0.88	0.81	0.74	0.67
2	1.59	1.50	1.41	1.32	1.24	1.16	1.08	1.00	0.93	0.85	0.78	0.71
5	1.64	1.55	1.46	1.37	1.29	1.21	1.13	1.05	0.97	0.90	0.83	0.76
10	1.73	1.64	1.55	1.46	1.38	1.29	1.21	1.13	1.06	0.98	0.91	0.84
15	1.80	1.71	1.61	1.53	1.44	1.34	1.28	1.19	1.12	1.04	0.97	0.90
20	1.86	1.77	1.68	1.58	1.50	1.42	1.33	1.25	1.17	1.10	1.02	0.95
30	1.97	1.87	1.78	1.68	1.60	1.51	1.43	1.35	1.27	1.19	1.12	1.04
40	2.06	1.96	1.86	1.77	1.68	1.60	1.51	1.43	1.35	1.27	1.19	1.12
50	2.13	2.04	1.94	1.85	1.76	1.67	1.58	1.50	1.42	1.34	1.26	1.19
60	2.20	2.09	2.00	1.90	1.81	1.73	1.64	1.56	1.47	1.39	1.31	1.24
70	2.26	2.16	2.06	1.96	1.87	1.78	1.70	1.61	1.53	1.45	1.37	1.29
75	2.28	2.18	2.09	1.99	1.90	1.81	1.72	1.64	1.55	1.47	1.39	1.32
80	2.31	2.21	2.11	2.02	1.93	1.84	1.75	1.66	1.58	1.50	1.42	1.34
90	2.36	2.26	2.16	2.06	1.96	1.88	1.79	1.71	1.62	1.54	1.46	1.38
100	2.41	2.31	2.20	2.11	2.02	1.93	1.84	1.75	1.66	1.58	1.50	1.42
125	2.51	2.39	2.30	2.20	2.13	2.03	1.93	1.85	1.77	1.68	1.60	1.53

RECOMMENDATIONS

1. For Maximum B.t.u. Capacity per Unit of Electric Consumption.	Use Models 30, 60, 90, 180.
2. For Maximum Normal Velocity without use of Velocity Nozzle.	Use Models 20, 25, 30, 40, 45, 50, 60, 65, 70, 80, 90, 100, 110, 140, 180.
3. For Lowest Outlet Temperatures (usually used when steam pressures are high).	Use Models 20, 25, 40, 45, 50, 65, 70, 80, 100, 110, 140.
4. Where Quietness of Operation and Low Velocity are requisite.	Use Models 20L, 25L, 30L, 40L, 45L, 50L, 60L, 65L, 70L, 80L, 90L, 100L, 110L, 140L, 180L.
5. For any one of above—Plus Extremely High Velocity.	Use Models as listed above for any given condition—with addition of Velocity Nozzle.

For Data at conditions other than listed, see our complete Thermolier Data Book. Copy on request.

DIMENSIONS

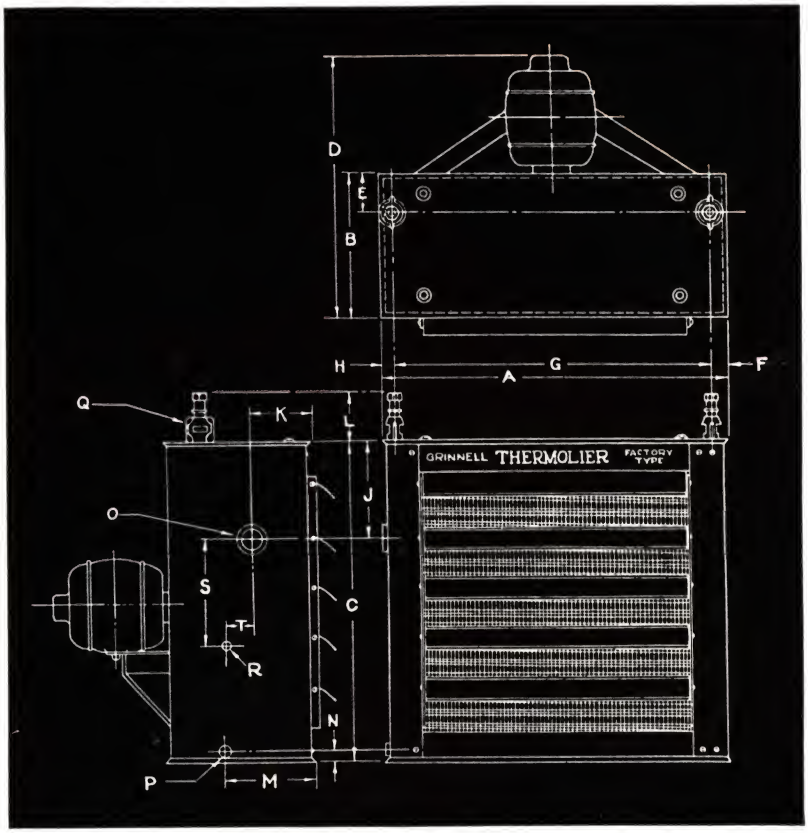
FACTORY TYPE

125 Lbs. Maxmimum Working Steam Pressure

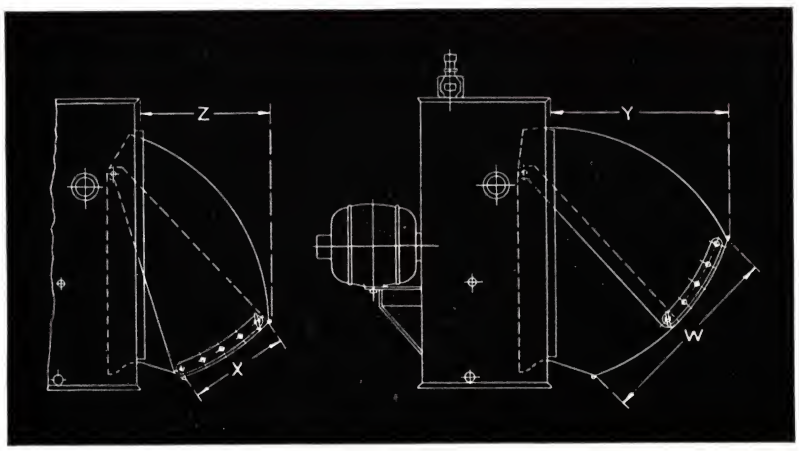
Model Numbers	20 20L 25 25L 30 30L	40 40L 45 45L 50 50L 60 60L	65 65L 70 70L 80 80L 90 90L	100 100L 110 110L 140 140L 180 180L
A	16	21¼	27¾	36 7/16
B	8⅛	9⅜	9¾	11 1/16
C	13	18½	25 9/16	32¾
*D	14⅝	16½	19 15/16	24⅛
E	2	2 11/16	2 13/16	3 7/16
F	31/32	1 1/16	1 11/16	1½
G	14	19⅛	24⅞	33 11/16
H	1 1/32	1 1/16	1 3/16	1¼
O	◄1	◄1½	◄2	◄2½
P	½	¾	‡1	‡1¼
†Q	⅜	½	⅝	⅞
R	⅜	⅜	⅜	⅜
Louvers	4	4	5	6

APPROXIMATE WEIGHTS
Complete Units—Pounds

Net	75	105	190	400
Shipping	85	145	245	545



APPLICATION OF VELOCITY NOZZLE TO FACTORY TYPE UNIT



All dimensions given in inches.

◄Steam tappings "O" in table apply to units listed except as follows: Models 25 and 25L, ¾"; 50 and 50L, 1¼"; 80 and 80L, 1½"; 140 and 140L, 2".

Air vent "R" is tapped ⅜-inch, but can be bushed as required.

*This dimension varies slightly with different motors.

†Adjustable Swivel Coupling (furnished with Thermolier) tapped standard bolt thread.

‡Outlets bushed to pipe size next smaller than indicated in table.

VELOCITY NOZZLES
Discharge Openings

Length	10¾	14¾	20¾	28
W–Max.	8¼	12¾	16 15/16	23
X–Min.	3⅜	6¾	8 7/16	10½

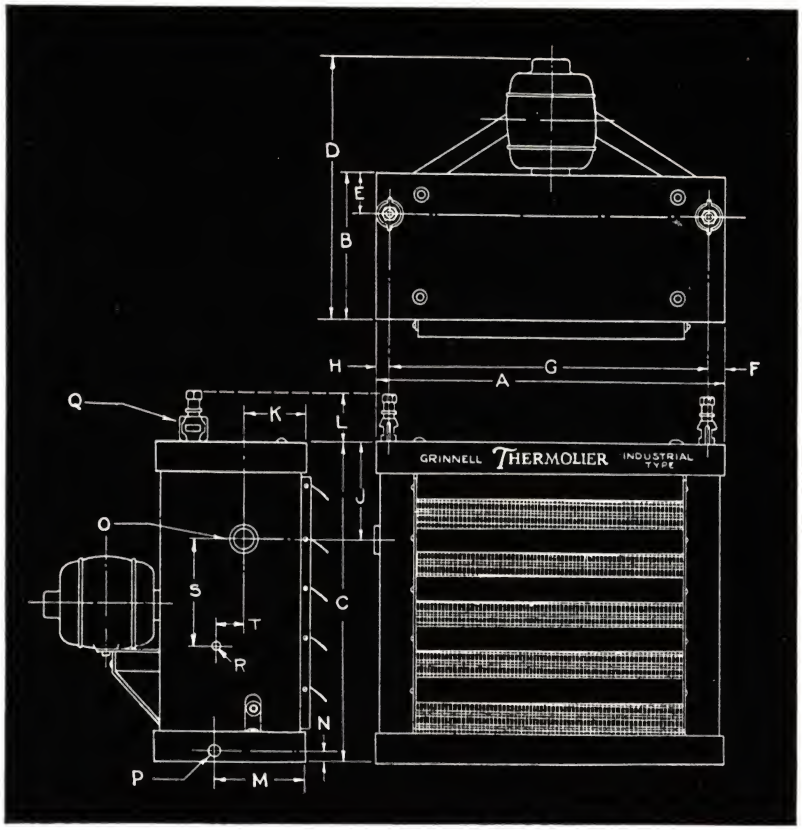
Overhang

Y–Max.	8⅝	11	15¼	22½
Z–Min.	5⅞	8	10¾	14½

DIMENSIONS

INDUSTRIAL TYPE

125 Lbs. Maxmimum Working Steam Pressure



Model Numbers				
	20	40	65	100
	20L	40L	65L	100L
	25	45	70	110
	25L	45L	70L	110L
	30	50	80	140
	30L	50L	80L	140L
		60	90	180
		60L	90L	180L
A	15 13/16	21 1/8	27 3/4	36 7/16
B	8 1/2	10 7/16	11 7/8	12 3/4
C	13	18 7/16	25 1/2	32 5/8
*D	14 5/8	17	21	25
E	2 3/16	2 15/16	3 7/8	4 1/4
F	7/8	1	1 11/16	1 1/2
G	14	19 1/8	24 7/8	33 11/16
H	15/16	1	1 3/16	1 1/4
O	◄1	◄1 1/2	◄2	◄2 1/2
P	1/2	3/4	‡1	‡1 1/4
†Q	3/8	1/2	5/8	7/8
R	3/8	3/8	3/8	3/8
Louvers	4	4	5	6

APPROXIMATE WEIGHTS
Complete Units—Pounds

Net	75	105	190	400
Shipping	85	145	245	545

APPLICATION OF VELOCITY NOZZLE TO INDUSTRIAL TYPE UNIT

All dimensions given in inches.

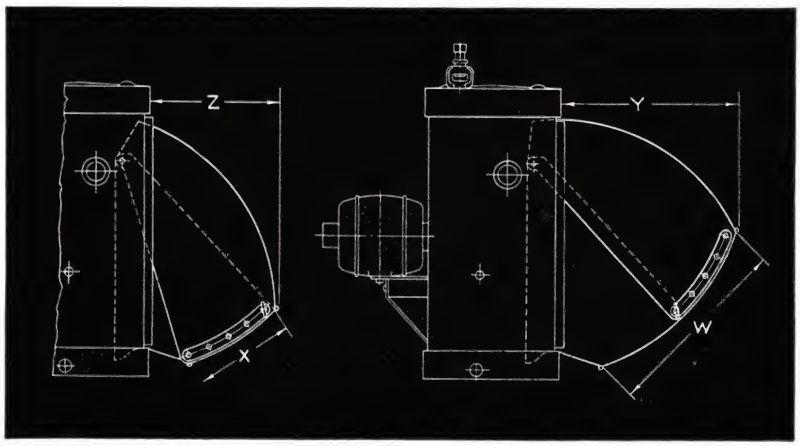
◄Steam tappings "O" in table apply to units listed except as follows: Models 25 and 25L, 3/4"; 50 and 50L, 1 1/4"; 80 and 80L, 1 1/2"; 140 and 140L, 2".

Air vent "R" is tapped 3/8-inch, but can be bushed as required.

*This dimension varies slightly with different motors.

†Adjustable Swivel Coupling (furnished with Thermolier) tapped standard bolt thread.

‡Outlets bushed to pipe size next smaller than indicated in table.



VELOCITY NOZZLES
Discharge Openings

Length	10 3/4	14 3/4	20 3/4	28
W–Max.	8 1/4	12 3/4	16 15/16	23
X–Min.	3 3/8	6 3/4	8 7/16	10 1/2
Overhang				
Y–Max.	8 5/8	11	15 1/4	22 1/2
Z–Min.	5 7/8	8	10 3/4	14 1/2

PIPING CONNECTIONS

TYPICAL PIPING CONNECTIONS FOR VACUUM OR VENTED RETURN GRAVITY SYSTEMS

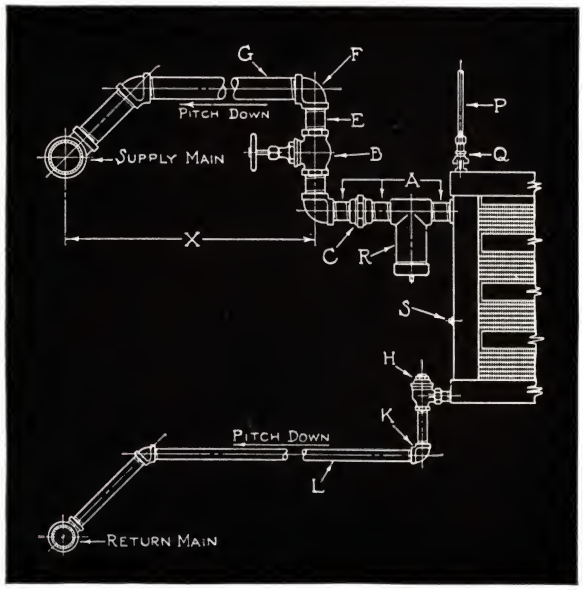


Fig. 1

Fig. 1 for equipments where distance "X" is less than 10 feet

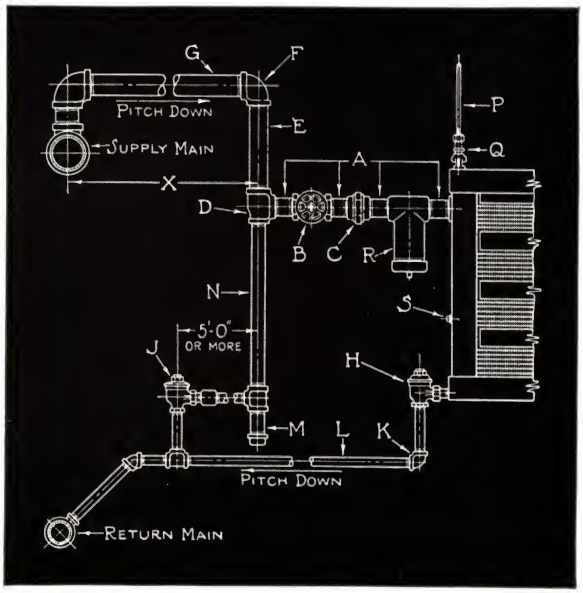


Fig. 2

Fig. 2 for equipments where distance "X" is more than 10 feet

TYPICAL SCHEDULE OF MATERIAL FOR THE ABOVE CONNECTIONS

Model Numbers	25L, 25	20, 20L, 30, 30L	50, 50L	40, 40L, 45, 45L, 60, 60L	80, 80L	65, 65L, 70, 70L, 90, 90L	140, 140L	100, 100L, 110, 110L, 180, 180L
Size of Drip Tapping	½"		¾"		1"		1¼"	
Size of Bushing furnished for above					1" x ¾"		1¼" x 1"	
A Nipples	¾"	1"	1¼"	1½"	1½"	2"	2"	2½"
B Globe or Gate Valve	¾"	1"	1¼"	1½"	1½"	2"	2"	2½"
C Union	¾"	1"	1¼"	1½"	1½"	2"	2"	2½"
D Cast Iron Tee								
E Pipe	¾"	1"	1¼"	1½"	1½"	2"	2"	2½"
*F Cast Iron Reducing Elbow								
*G Supply Run-out								
†H Thermoflex Trap 0 to 25 Lbs.	½" No. 2		¾" No. 2		¾" No. 3, 4		See Note	
25 to 125 Lbs.	½" No. 100A		½" No. 100A		¾" No. 100A		1" No. 100A	
†J Thermoflex Trap 0 to 25 Lbs.	½" No. 2		½" No. 2		½" No. 2		½" No. 2	
25 to 125 Lbs.	½" No. 100A		½" No. 100A		½" No. 100A		½" No. 100A	
K Cast Iron Elbow	¾" x . . . §		1" x ¾"		1" x ¾"		1¼" x . . .	
L Pipe	¾"		1"		1"		1¼"	
M Scale Pocket	1¼"		1¼"		1¼"		1½"	
N Pipe	1¼"		1¼"		1¼"		1½"	
P Hanger Rod (See pages 20 and 21)	⅜"		½"		⅝"		⅞"	
Q Adj. Swivel Coupling (Furnished)	⅜"		½"		⅝"		⅞"	
R Sediment Strainer	¾"	1"	1¼"	1½"	1½"	2"	2"	2½"
S Pipe Plug (Furnished)	⅜"		⅜"		⅜"		⅜"	

*Size governed by installation conditions.

†Union required if other than a union end trap is specified.

Note: Trap H = 1" No. 4 for Models 100, 100L, 110, 110L, 140L and 180L; 1¼" No. 4 for Models 140 and 180.

§½" Nos. 2 and 3 traps have ¾" outlets.

PIPING CONNECTIONS

TYPICAL PIPING CONNECTIONS FOR CLOSED RETURN GRAVITY SYSTEMS

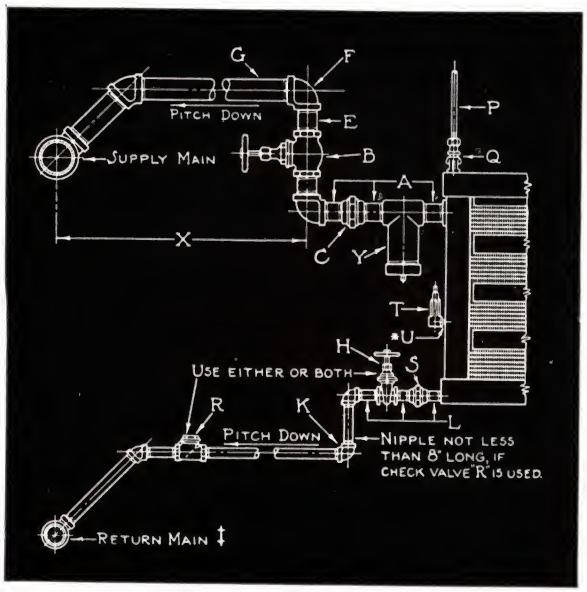


Fig. 3
Fig. 3 for equipments where distance "X" is less than 10 feet

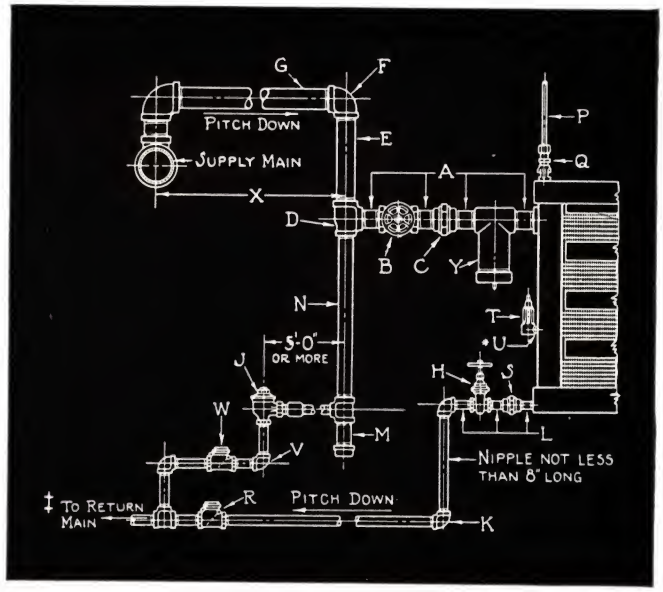


Fig. 4
Fig. 4 for equipments where distance "X" is more than 10 feet

‡Note: Return mains or risers must be vented, preferably at point where lines drop below waterline of boiler

TYPICAL SCHEDULE OF MATERIAL FOR THE ABOVE CONNECTIONS

	Model Numbers	25 25L	20 20L 30 30L	50 50L	40 40L 45 45L 60 60L	80 80L	65 65L 70 70L 90 90L	140 140L	100 100L 110 110L 180 180L
	Size of Drip Tapping	½"		¾"		1"		1¼"	
	Size of Bushing furnished for above					1" x ¾"		1¼" x 1"	
A	Nipples	¾"	1"	1¼"	1½"	1½"	2"	2"	2½"
B	Globe or Gate Valve	¾"	1"	1¼"	1½"	1½"	2"	2"	2½"
C	Union	¾"	1"	1¼"	1½"	1½"	2"	2"	2½"
D	Cast Iron Tee								
E	Pipe	¾"	1"	1¼"	1½"	1½"	2"	2"	2½"
*F	Cast Iron Reducing Elbow								
*G	Supply Run-out								
H	Gate Valve	½"		¾"		¾"		1"	
†J	Thermoflex Trap 0 to 25 Lbs.	½" No. 2		½" No. 2		½" No. 2		½" No. 2	
	25 to 125 Lbs.	½" No. 100A		½" No. 100A		½" No. 100A		½" No. 100A	
K	Cast Iron Reducing Elbow	¾" x ½"		1" x ¾"		1" x ¾"		1¼" x 1"	
L	Nipples	½"		¾"		¾"		1"	
M	Scale Pocket	1¼"		1¼"		1¼"		1½"	
N	Pipe	1¼"		1¼"		1¼"		1½"	
P	Hanger Rod (See pages 20 and 21)	⅜"		½"		⅝"		⅞"	
Q	Adj. Swivel Coupling (Furnished)	⅜"		½"		⅝"		⅞"	
R	Check Valve	¾"		1"		1"		1¼"	
S	Union	½"		¾"		¾"		1"	
T	Air Valve	⅛"		⅛"		⅛"		⅛"	
U	Bushing	⅜" x ⅛"		⅜" x ⅛"		⅜" x ⅛"		⅜" x ⅛"	
V	Cast Iron Elbow	¾" x . . .§		¾" x . . .§		¾" x . . .§		¾" x . . .§	
W	Check Valve	¾"		¾"		¾"		¾"	
Y	Sediment Strainer	¾"	1"	1¼"	1½"	1½"	2"	2"	2½"

*Size governed by installation conditions.

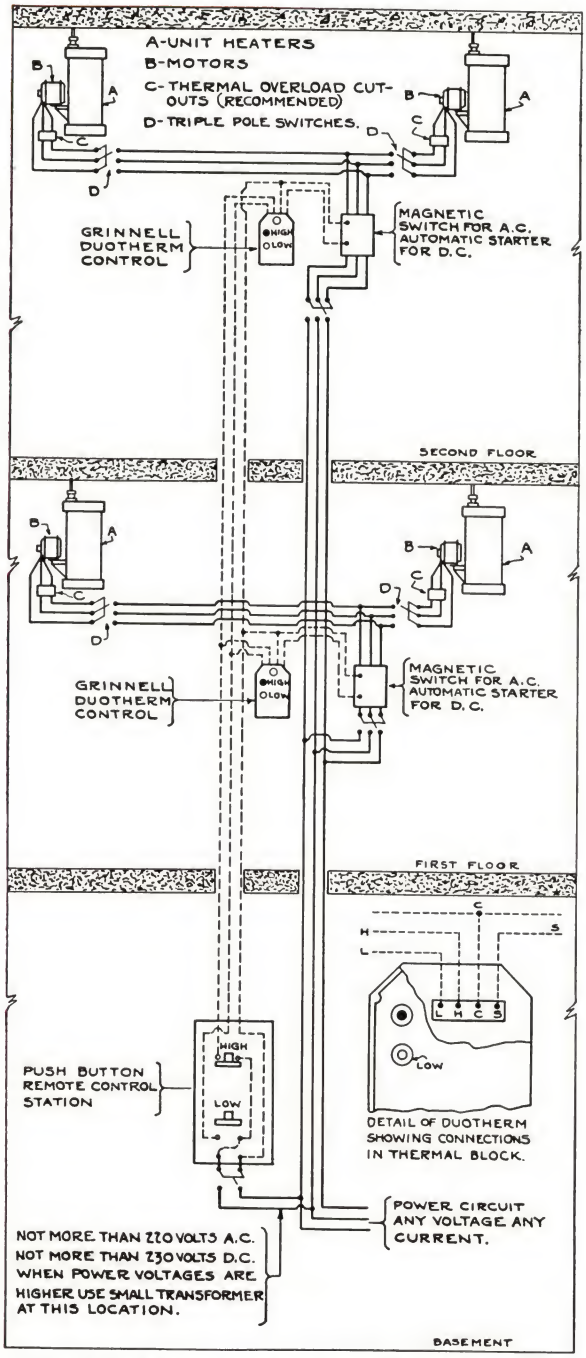
§½" Nos. 2 and 3 traps have ¾" outlets.

†Union required if other than a union end trap is specified.

DUOTHERM CONTROL
FOR UNIT HEATING SYSTEMS

THE Grinnell Duotherm Control is a device for regulating room temperatures where unit heating systems are installed. With this device a high temperature is automatically maintained when required, and a low temperature automatically maintained during idle hours such as at night and on Sundays and holidays. This wide range of high and low temperatures cannot be secured by the ordinary single thermostat control.

The advantages to be secured from this control are at once obvious to anyone familiar with the proper and most economical handling of heating equipments in industrial plants. Bulletin No. A-3 giving a more complete description of this product, also a detailed analysis of the economies to be had by its use, will be mailed upon request.



Typical Unit Heater Installation Showing How Grinnell Duotherms May All Be Controlled from One Central Point by High-Low Remote Control

REMOTE CONTROL

The Grinnell Duotherm is applicable to single room temperature control but the most important economies to be gained by its use are in the remote control of temperatures throughout large plants. When so used, the temperatures throughout the whole plant are under the control of one responsible individual in the boiler room or any other convenient place.

CONSTRUCTION

The thermostats together with switches, coils and other parts are compactly mounted in a cast aluminum box with sides and bottom perforated to provide proper circulation of air around the thermostats. Adjustment of the thermostats is made through a hinged and locked bottom drop panel. Binding post strip is plainly marked to insure proper connection of wiring to the device.

High or black push-button and *low* or red push-button are enclosed in a separate compartment.

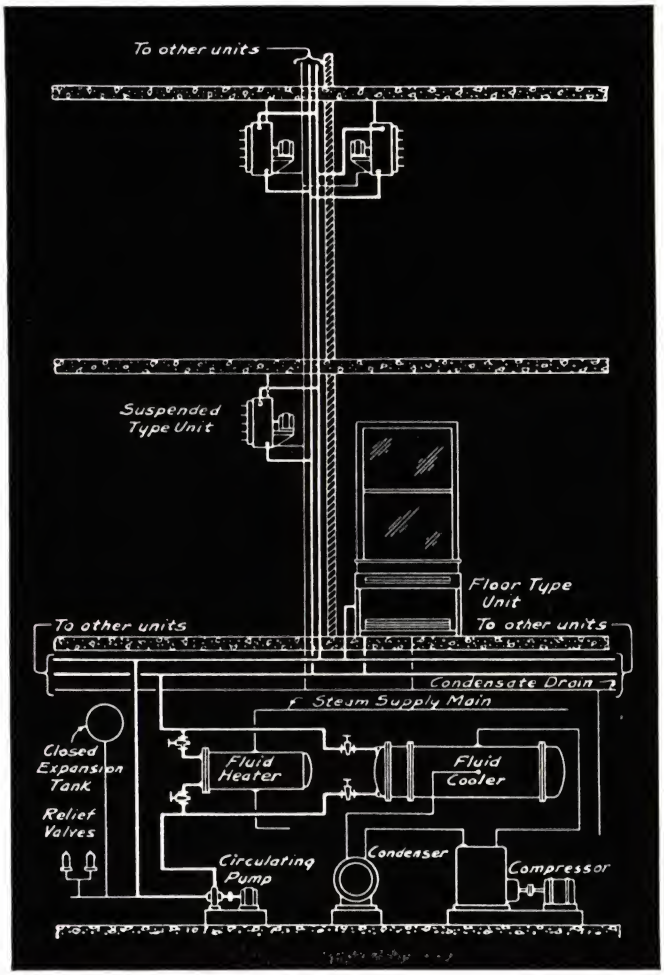
Whenever *high* temperature control thermostat is in operation, a red bull's eye is illuminated by a small electric light in a properly ventilated enclosure on top of the main unit.

Remote control, a standard two-button push-button box, can be mounted on wall or other convenient point.

■

Note: Magnetic Switch for A.C. or Automatic Starter for D.C. must always be used when Grinnell Duotherm Controls are installed, regardless of the number of units to be controlled.

AIR CONDITIONING TYPE



WITH Thermolier—Air Conditioning Type—it is just as easy to cool and dehumidify a building in summer as it is to heat it in winter. By reference to the drawing at the left, which shows a typical application of this equipment, the absolute simplicity and easy adaptability of this system to existing buildings becomes at once apparent.

Simplicity of installation is possible because the air is conditioned right at the point where it is needed. Instead of circulating a large volume of air which has been conditioned at a central point, this system circulates the cooling or heating fluid through small pipes and all the air conditioning takes place right at the unit. Units can be placed anywhere—suspended from the ceiling either exposed or concealed—or placed on the floor in an attractive cabinet.

This basic principle, besides making for practicability of installation, also lowers the first cost and provides for local control thus cutting the operating expense.

The sketch at the left shows a fluid heater with steam supply main for heating in winter and a fluid cooler with condenser and compressor as one method of cooling the fluid for summer use. Other methods of cooling such as ice bunkers or steam vacuum refrigerating systems may just as well be used. Conditions surrounding each individual installation govern the choice of the refrigeration method.

A booklet with complete description of this Air Conditioning Type unit will be sent by any of our branch offices on request.

ELECTRIC TYPE

THE Grinnell Thermolier is also offered in the Electric Type to meet a long recognized need for the same ideal heating comfort that unit heaters are providing in so many industrial and commercial buildings. This new development provides such heating perfection for isolated buildings where steam or hot water is not conveniently or economically available. This is especially true of plants generating their own power or where power can be purchased at favorable rates.

Where climatic conditions are such that heating is a more or less intermittent thing, this unit which is made in six models, will provide ample heat for large areas without necessitating the installation of boilers.

In fact, the adaptability of this heater is such that it successfully meets a great variety of unusual heating requirements. This will readily be apparent when it is realized that the Grinnell Thermolier—Electric Type—has all of these advantages:

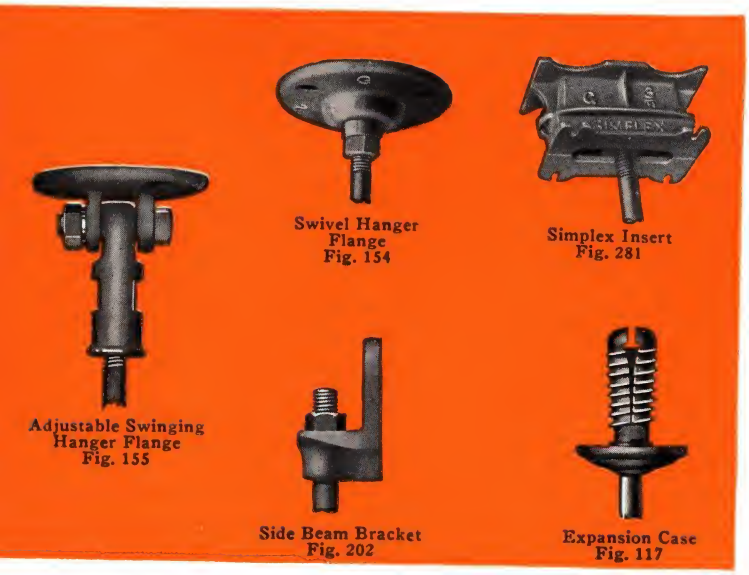
1—100% Efficiency
2—Perfect Automatic Control Obtainable
3—Elimination of Boiler Installation, Maintenance and Repair
4—Uniform Heat Distribution
5—Economical Installation
6—Portability
7—Saving in space as against ordinary Electric Heaters of equal capacity.

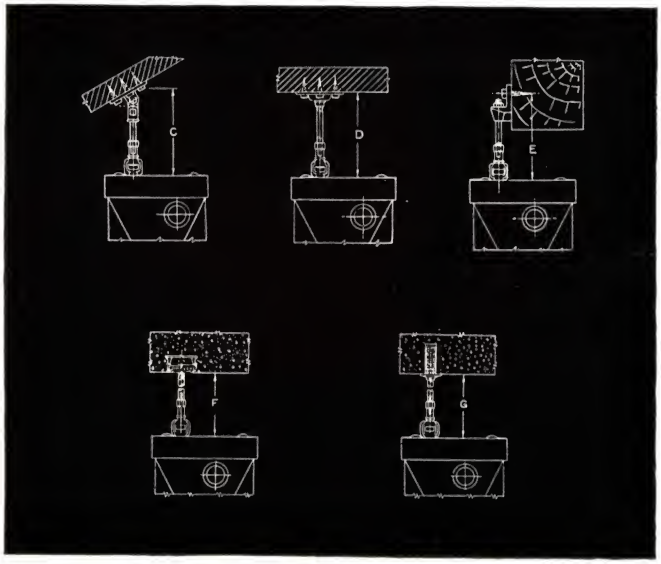
A booklet giving dimensions, capacities, motor characteristics, etc., will be mailed on request.

The following is a partial list of typical locations where these units may be installed to advantage:

Power Plants
Sub-Stations
Temporary Construction
Bridge Control Houses
Valve Houses
Gatekeeper Houses
Gasoline Stations
Garages
Drying Processes
Waiting Rooms
Crane Cabs
Bridge Toll Houses

ADJUSTABLE HANGERS



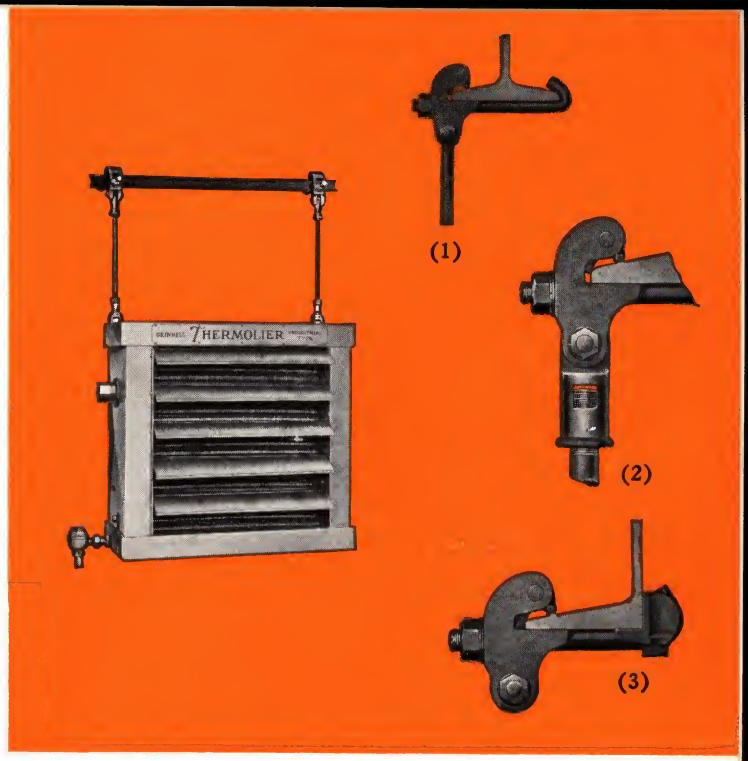


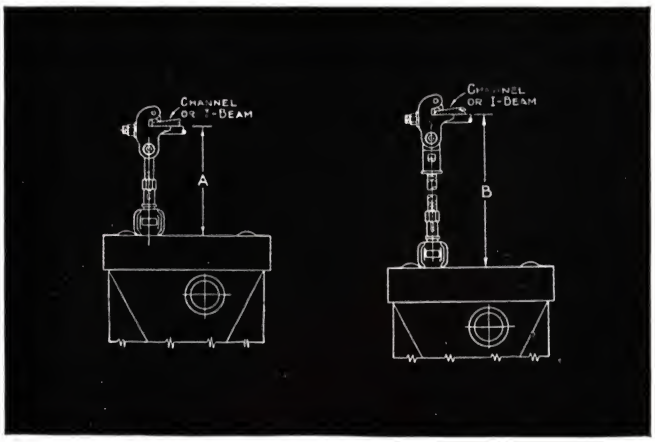
Application of Adjustable Hangers to Thermolier	Quantity and Size, Per Hanger			
	20-20L 25-25L 30-30L	40-40L 45-45L 50-50L 60-60L	65-65L 70-70L 80-80L 90-90L	100-100L 110-110L 140-140L 180-180L
Suspended from Pitched Wood Roofs				
For Ordering Hangers, Specify—				
(Quan.) (Rod size) Fig. 155 Adj. Swinging Hanger Flanges	1–3/8″	1–1/2″	1–5/8″	1–7/8″
(Quan.) (Size) Coach or Wood Screws	2–1½″ # 18	3–3/8″x2″	3–1/2″x2″	3–5/8″x2″
(Quan.) (Rod size) Fig. 140 Hanger Rods. (State Length*)	1–3/8″	1–1/2″	1–5/8″	1–7/8″
*For correct Hanger Rod Length, deduct from Dimension "C"	4½″	5½″	6″	9″
Suspended from Flat Wood Roofs or Ceilings				
For Ordering Hangers, Specify—				
(Quan.) (Rod size) Fig. 154 Swivel Hanger Flanges	1–3/8″	1–1/2″	1–5/8″	1–7/8″
(Quan.) (Size) Coach or Wood Screws	2–1½″ # 18	3–3/8″x2″	3–1/2″x2″	3–5/8″x2″
(Quan.) (Rod Size) Fig. 140 Hanger Rods. (State Length †)	1–3/8″	1–1/2″	1–5/8″	1–7/8″
† For correct Hanger Rod Length, deduct from Dimension "D"	2½″	2½″	3½″	5″
Suspended from Side of Wood or Concrete Beams				
For Ordering Hangers, Specify—				
(Quan.) (Rod size) Fig. 202 Side Beam Brackets	1–3/8″	1–1/2″	1–5/8″	1–7/8″
(Quan.) (Size) Coach Screws—for Wood Beams	1–3/8″x2½″	1–1/2″x3″	1–5/8″x3″	1–7/8″x4″
or				
Fig. 117 Expan. Bolts & Cases—for concrete	1–3/8″x2″	1–1/2″x2½″	1–5/8″x3″	1–7/8″x4½″
(Quan.) (Size) Hexagonal Nuts	1–3/8″	1–1/2″	1–5/8″	1–7/8″
(Quan.) (Rod Size) Fig. 140 Hanger Rods. (State Length ‡)	1–3/8″	1–1/2″	1–5/8″	1–7/8″
‡ For correct Hanger Rod Length, deduct from Dimension "E"	1½″	2″	3″	5″
Suspended from Concrete (by Inserts)				
For Ordering Hangers, Specify—				
(Quan.) (Rod size) Fig. 281 Simplex Inserts	1–3/8″	1–1/2″	1–5/8″	1–7/8″
or				
Fig. 282 CB-Universal Inserts, with Nuts	1–3/8″	1–1/2″	1–5/8″	not made
(Quan.) (Rod Size) Fig. 140 Hanger Rods. (State Length §)	1–3/8″	1–1/2″	1–5/8″	1–7/8″
§ For correct Hanger Rod Length, deduct from Dimension "F"	1″	1½″	1½″	2″
Suspended from Concrete (by Expansion Cases)				
For Ordering Hangers, Specify—				
(Quan.) (Rod size) Fig. 117 Expansion Cases	1–3/8″	1–1/2″	1–5/8″	1–7/8″
(Quan.) (Rod size) Fig. 215 Ceiling Plates	1–3/8″	1–1/2″	1–5/8″	1–7/8″
(Quan.) (Rod size) Fig. 140 Hanger Rods. (State Length▼)	1–3/8″	1–1/2″	1–5/8″	1–7/8″
▼For correct Hanger Rod Length, deduct from Dimension "G"	0″	0″	0″	1″

ADJUSTABLE HANGERS

Suspended from I Beams or Channels

1. Shows Universal Side I Beam Clamp, Fig. 225; with Extension Eye Bolt, Fig. 220.
2. Shows application of Extension Piece, Fig. 157, and Hanger Rod to Universal Clamps.
3. Shows Universal Channel Clamp, Fig. 226.





For Ordering Short Hangers, Specify—

(Quan.) (Rod size) { Fig. 225 Universal Side I Beam Clamps (State depth, weight and type of beam) or Fig. 226 Universal Channel Clamps (State depth, weight and type of channel).

(Quan.) (Rod size) { Fig. 220 Extension Eye Bolts (Specify length from table below–*).

LENGTHS OF EXTENSION EYE BOLTS REQUIRED FOR VARYING LENGTHS OF DIMENSION "A"

Using Fig. 220 Extension Eye Bolt, in conjunction with either Fig. 225 or 226 Clamps

Model Numbers	20-20L 25-25L 30-30L		40-40L 45-45L 50-50L 60-60L		65-65L 70-70L 80-80L 90-90L		100-100L 110-110L 140-140L 180-180L	
	*	"A"	*	"A"	*	"A"	*	"A"
Fig. 220 Ext. Eye Bolt:								
Short	2½"	5" –6¼"	2¾"	6" – 7½"	3"	6⅞"– 8⅝"	3¼"	9" –10½"
Medium	4"	6½"–7¾"	4¼"	7½"– 9"	4½"	8⅜"–10⅛"	4¾"	10½"–12"
Long	5½"	8" –9¼"	5¾"	9" –10½"	6"	9⅞"–11⅝"	6¼"	12" –13½"
Hanger Rod Size		⅜"		½"		⅝"		⅞"

For Ordering Longer Hangers, Specify—

(Quan.) (Rod size) { Fig. 225 Universal Side I Beam Clamps (State depth, weight and type of beam) or Fig. 226 Universal Channel Clamps (State depth, weight and type of channel).

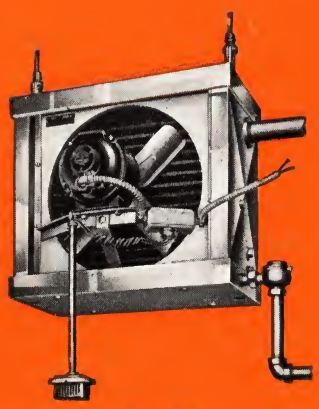
(Quan.) (Rod size) Fig. 157 Extension Pieces.

(Quan.) (Rod size) Fig. 140 Hanger Rods (Specify length from table below).

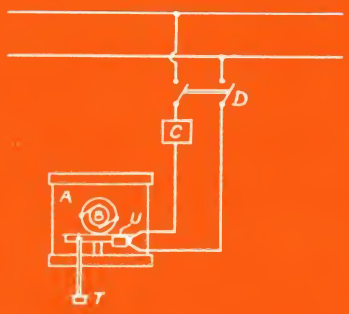
Model Numbers	20-20L 25-25L 30-30L	40-40L 45-45L 50-50L 60-60L	65-65L 70-70L 80-80L 90-90L	100-100L 110-110L 140-140L 180-180L
Hanger Rod Size	⅜"	½"	⅝"	⅞"
Correct Length of Hanger Rod.	"B" minus 4½"	"B" minus 5½"	"B" minus 6½"	"B" minus 8"

Front View

Thermostat



Rear View



AUTOMATIC THERMOLIER

SIMPLIFIED thermostatic temperature control of unit heaters is now available in standardized form for the first time in the Grinnell Automatic Thermolier.

This arrangement provides a simple, convenient, practical and economical method of room temperature control by individual control of each Thermolier. While primarily intended for applications requiring but a single Thermolier, it also offers installation savings in areas heated by two or more widely spaced Thermoliers which would normally be controlled by one thermostat.

The automatic attachment consists of a free swinging adjustable thermostat suspended from the motor bracket as illustrated above. The only wiring required is to run the service to the conduit box and plug in the twist lock cap. Each Automatic Thermolier is shipped with motor wired to the conduit box as illustrated.

The initial setting of the thermostat can be made either by personal comfort requirements or more accurately by readings of a thermometer located in the comfort or working zone. Once set, the thermostat need not be disturbed unless a different temperature is desired.

The Grinnell Automatic Thermolier can be furnished in Thermolier sizes as follows:—

Models 20 to 90 and 20L to 180L inclusive for 110 or 220 volts, single phase A.C.

Models 20 to 90 and 20L to 90L inclusive for 115 or 230 volts D.C.

When ordering these individually-controlled unit heaters specify "Automatic Thermolier," stating Model Number and electrical characteristics.

A—Thermoliers.

B—Thermolier Motors.

C—Thermal Overload Cut-outs (Recommended).

D—Double Pole Switches.

T—Grinnell Automatic Thermostat.

U—Conduit Box.

THERMOLIER

de luxe type

★

THERMOLIER *de luxe type*

FRONT VIEW OF THERMOLIER De LUXE TYPE . . . note modern design, and louver construction for better heat distribution, and the non-reflecting finish of art metal slate gray and satin chrome.

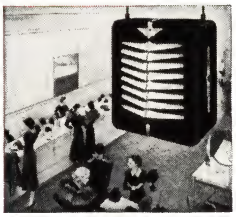
SIDE VIEW . . . the specially-designed motor is recessed within the housing, as is the thermostatic trap.

REAR VIEW . . . inlet and outlet pipe connections have been moved to the rear *inside of the housing* . . . from any side, Thermolier de luxe type looks well.

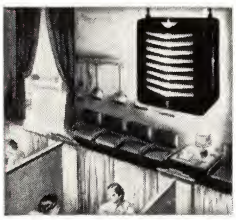
SPECIAL FEATURES

of the THERMOLIER *de luxe type*

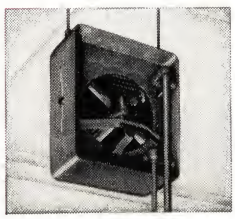
de luxe **HOUSING** . . . created by leading industrial designers to harmonize with the appointments of modern stores, restaurants, shops and offices.



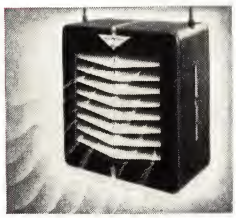
de luxe **COLOR SCHEME** . . . combining art metal slate gray with non-reflecting satin chrome . . . lends itself to any color motif, yet remains a background part of the decorative scheme.



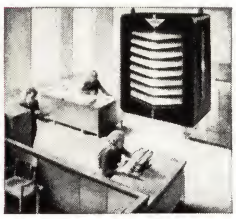
de luxe **CONSTRUCTION** . . . the same fourteen points of superiority that have maintained Thermolier's leadership in unit heating, *plus recessed motor and concealed inlet and outlet pipe connections inside of housing in rear, out of sight.*



de luxe **HEAT DISTRIBUTION** . . . entirely new louver design gives wider angular spread of heat for greater effective area of coverage with same efficient downward delivery.



de luxe **OPERATION** . . . "lazy water" eliminated by the time-proven, built-in cooling leg in conjunction with especially engineered fan and motor to ensure most efficient operation.



★ *The heating element and the entire internal construction of Thermolier de luxe type is identical with the time-tested Factory and Industrial type Thermoliers, assuring the peak of Unit Heater efficiency, performance and reliability.*

CAPACITIES *of the* THERMOLIER *de luxe type*

WHEN RUN AT NORMAL SPEEDS

All based on Standard Basis of Rating (2 lbs. Steam Pressure and 60° Entering Air Temperature).

Note: For Capacities at other Pressures and Temperatures, see Conversion Table, page 28.

Models	R.P.M. at Normal Speeds	Total Heat delivered, B.t.u. per hr.	Equivalent Direct Radiation E.D.R.	C.F.M. (70° F. Vol.) at 60° F. Enter. Air	C.F.M. at Exit Air Temp.	Exit Air temp., ° Fahr.	Condensation, lb. per hr.	Air Velocity at Exit—Linear Ft. per Min.	
								Louvers Wide Open	Louvers Set at 45°
20	**1750**	**35,000**	**146**	**599**	**646**	**114**	**35**	**955**	**1192**
20L	1150	26,900	112	406	438	122	28	648	811
25	**1750**	**40,500**	**169**	**617**	**685**	**120**	**42**	**1012**	**1265**
25L	1150	30,900	128	427	475	127	32	703	880
30	**1750**	**47,800**	**199**	**506**	**579**	**147**	**49**	**858**	**1072**
30L	1150	35,200	147	345	395	156	37	584	730
40	**1750**	**69,400**	**289**	**1475**	**1566**	**104**	**72**	**1051**	**1420**
40L	1150	53,300	222	954	1030	112	56	692	935
45	**1750**	**81,200**	**339**	**1792**	**1810**	**105**	**84**	**1214**	**1640**
45L	1150	62,600	261	1107	1196	113	66	803	1182
50	**1750**	**90,700**	**378**	**1661**	**1794**	**111**	**93**	**1202**	**1628**
50L	1150	67,100	280	1084	1182	118	70	795	1172
60	**1750**	**104,800**	**437**	**1267**	**1424**	**137**	**108**	**956**	**1291**
60L	1150	77,700	324	817	938	148	81	629	850
65	**1150**	**129,500**	**540**	**2170**	**2356**	**115**	**134**	**810**	**1092**
65L	850	110,100	459	1630	1792	123	114	617	834
70	**1150**	**142,000**	**592**	**2312**	**2895**	**109**	**147**	**995**	**1341**
70L	850	117,000	490	1722	2160	114	122	743	1020
80	**1150**	**164,600**	**686**	**2623**	**2884**	**117**	**171**	**992**	**1339**
80L	850	139,300	580	1932	2180	125	143	749	1028
90	**1150**	**189,200**	**788**	**2016**	**2298**	**144**	**196**	**789**	**1063**
90L	850	151,600	632	1475	1702	152	156	586	791

RECOMMENDATIONS

1 For Maximum B.T.U. Capacity per Unit of Electric Consumption . . . . . Use Models 30, 60, 90.

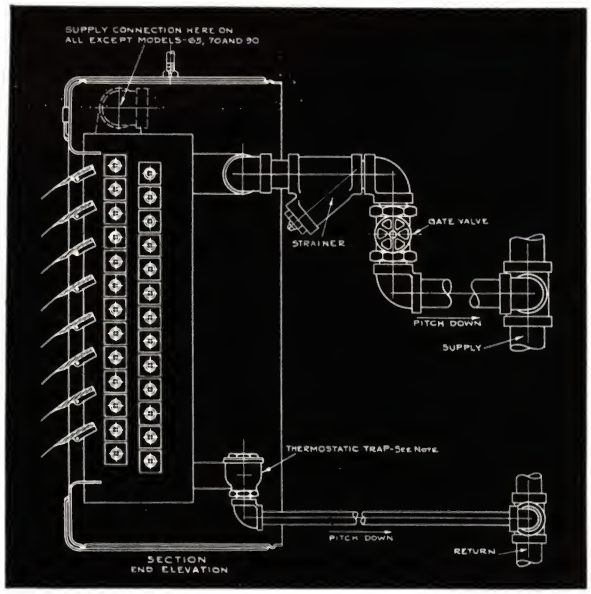
2 For Maximum Normal Velocity . . . . . Use Models 20, 25, 30, 40, 45, 50, 60, 65, 70, 80, 90.

3 For Lowest Outlet Temperatures (Usually used when steam pressures are high) . Use Models 20, 25, 40, 45, 50, 65, 70, 80.

4 Where Quietness of Operation and Low Velocity are requisite . . . . . Use Models 20L, 25L, 30L, 40L, 45L, 50L, 60L, 65L, 70L, 80L, 90L.

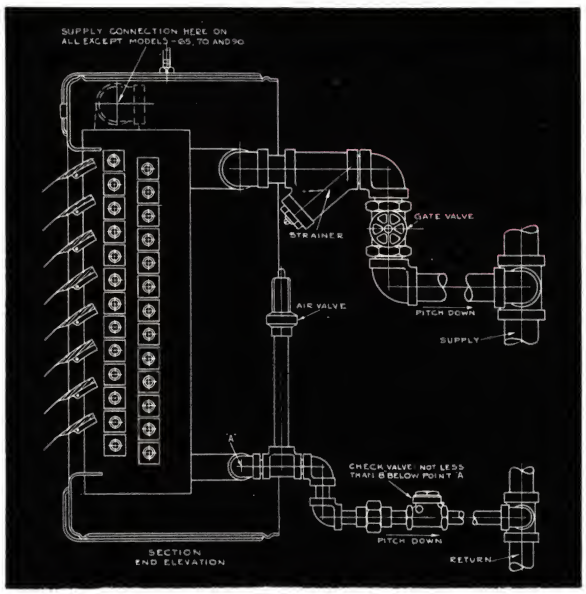
PIPING CONNECTIONS (Typical)

of the THERMOLIER *de luxe type*



For Vacuum or Vented Return Gravity Systems

Note: On Models 30 and smaller use R.H. Corner Pattern Trap.



For Closed Return Gravity Systems

CONVERSION TABLE

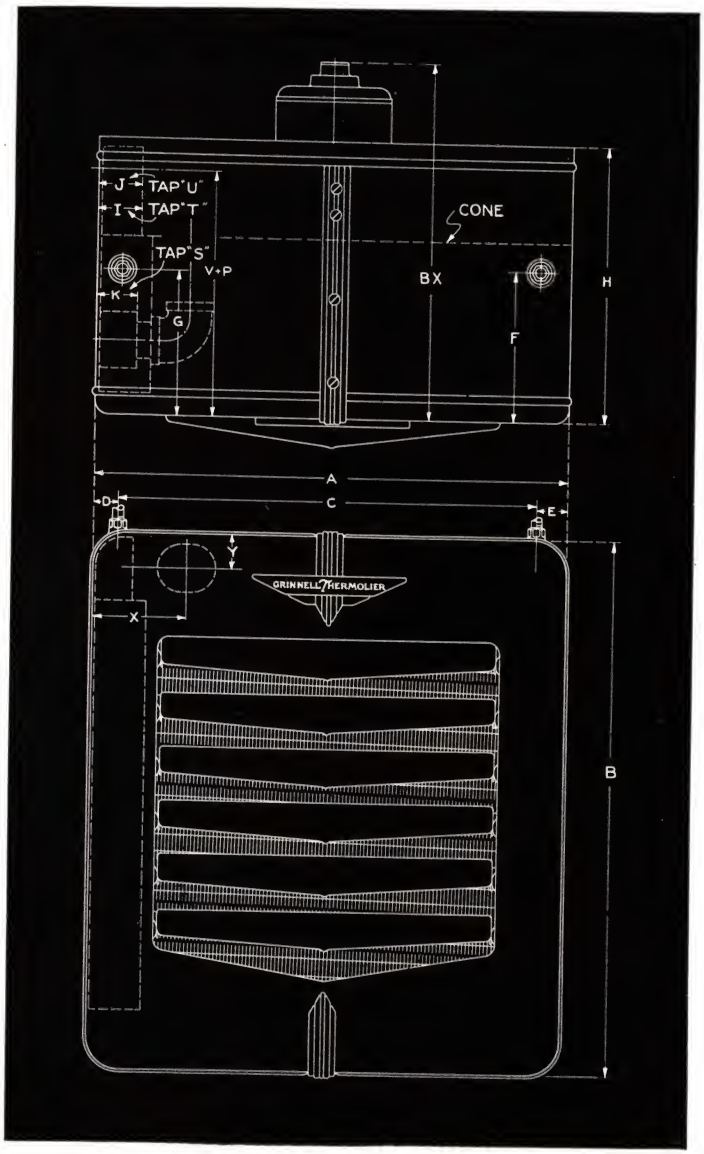
Constants for Determining the Capacities of Thermoliers for Various Steam Pressures and Temperatures of Entering Air. *(Based on Steam Pressure of 2 lbs. Gage and 60° Entering Air Temperature.)*

To determine Capacity at any Steam Pressure and Entering Air Temperature, multiply Rated Capacity at 2 lbs. Steam Pressure and 60° Entering Air Temperature by Constant from Table below.

Example: Required to find the Capacity of Model 90 Thermolier at 30 lbs. Steam Pressure and 80° Entering Air Temperature. Multiply Capacity of Model 90 at 2 lbs., 60° (189,200 B.t.u.) by Constant (1.19). 189,200 B.t.u. × 1.19 = 225,148 B.t.u.

STEAM PRESSURE Pounds—Gage	Temperature of Entering Air—Degrees Fahr.											
	—10°	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°
0	1.54	1.45	1.37	1.27	1.19	1.11	1.03	0.96	0.88	0.81	0.74	0.67
2	1.59	1.50	1.41	1.32	1.24	1.16	1.08	1.00	0.93	0.85	0.78	0.71
5	1.64	1.55	1.46	1.37	1.29	1.21	1.13	1.05	0.97	0.90	0.83	0.76
10	1.73	1.64	1.55	1.46	1.38	1.29	1.21	1.13	1.06	0.98	0.91	0.84
15	1.80	1.71	1.61	1.53	1.44	1.34	1.28	1.19	1.12	1.04	0.97	0.90
20	1.86	1.77	1.68	1.58	1.50	1.42	1.33	1.25	1.17	1.10	1.02	0.95
30	1.97	1.87	1.78	1.68	1.60	1.51	1.43	1.35	1.27	1.19	1.12	1.04
40	2.06	1.96	1.86	1.77	1.68	1.60	1.51	1.43	1.35	1.27	1.19	1.12
50	2.13	2.04	1.94	1.85	1.76	1.67	1.58	1.50	1.42	1.34	1.26	1.19
60	2.20	2.09	2.00	1.90	1.81	1.73	1.64	1.56	1.47	1.39	1.31	1.24
70	2.26	2.16	2.06	1.96	1.87	1.78	1.70	1.61	1.53	1.45	1.37	1.29
75	2.28	2.18	2.09	1.99	1.90	1.81	1.72	1.64	1.55	1.47	1.39	1.32
80	2.31	2.21	2.11	2.02	1.93	1.84	1.75	1.66	1.58	1.50	1.42	1.34
90	2.36	2.26	2.16	2.06	1.96	1.88	1.79	1.71	1.62	1.54	1.46	1.38
100	2.41	2.31	2.20	2.11	2.02	1.93	1.84	1.75	1.66	1.58	1.50	1.42
125	2.51	2.39	2.30	2.20	2.13	2.03	1.93	1.85	1.77	1.68	1.60	1.53

DIMENSIONS *of the*

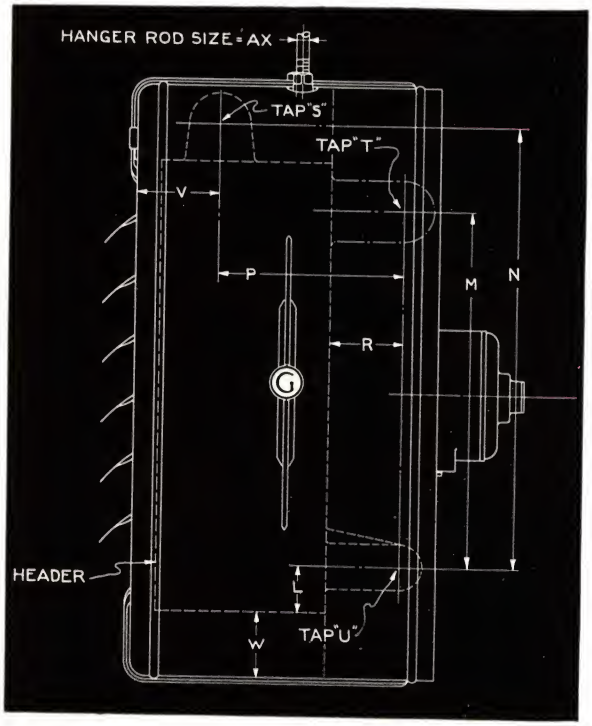


THERMOLIER

de luxe type

125 LBS. MAXIMUM

WORKING STEAM PRESSURE



Models	A	B	C	D	E	F	G	H	I	J	K	L	M	N	P	R	S	T	U	V*	W	X*	Y*	AX	B*
	16 1/8	17 15/16	13 7/16	1 11/32	1 11/32	6	5 7/8	11	....	....	....	....	....	....	....	....	....	....	....	2 3/4	2 1/4	4 1/8	1 7/16	3/8	14 1/8
20 to 30 Incl.	Mod. 20, 20L, 30, 30L Steam								....	1 3/4	1 3/4	1 1/8	.....	13 1/8	7 3/16	3	1	...	1/2	....	....	....	....	....	....
	Mod. 25, 25L Steam								....	1 3/4	2 1/4	1 3/4	.....	12 1/2	7 3/16	3	1	...	1/2	....	....	....	....	....	....
	Mod. 20, 20L, 30, 30L Hot Water								....	1 3/4	1 3/4	1 3/4	.....	12 1/2	6 7/16	2 1/4	3/4	...	3/4	....	....	....	....	....	....
	Mod. 25, 25L Hot Water								....	1 13/16	2 1/4	1 3/4	.....	12 1/2	6 7/16	2 1/4	3/4	...	3/4	....	....	....	....	....	....
	21 1/2	24 1/8	19	1 1/8	1 3/8	6 3/4	6 1/2	12 1/2	....	....	....	....	.....	....	....	....	....	....	....	3 3/8	2 5/8	4 1/4	1 9/16	1/2	16 5/8
40 to 60 Incl.	Mod. 40, 40L, 45, 45L, 60, 60L Steam								....	1 3/4	1 13/16	1 15/16	.....	18	7 7/8	3	1 1/2	...	3/4	....	....	....	....	....	....
	Mod. 50, 50L Steam								....	1 15/16	1 13/16	2 1/4	.....	17 11/16	7 5/8	3	1 1/4	...	3/4	....	....	....	....	....	....
	Mod. 40, 40L, 45, 45L, 60, 60L Hot Water								....	1 13/16	1 13/16	1 15/16	.....	18	7 5/8	3	1	...	1	....	....	....	....	....	....
	Mod. 50, 50L Hot Water								....	1 15/16	1 13/16	2 1/4	.....	17 11/16	7 5/8	3	1	...	1	....	....	....	....	....	....
	27 1/2	32	24 3/4	1	1 3/4	7	7	15	....	....	....	....	.....	....	....	....	....	....	....	3 1/2	3 1/16	4 7/8	1 3/4	5/8	19 1/4
65 to 90 Incl.	Mod. 65, 65L, 70, 70L, 90, 90L Steam								1 15/16	1 15/16	....	1 29/32	20 25/32	....	....	3 1/2	...	2	3/4	....	....	....	....	....	....
	Mod. 80, 80L Steam								....	1 15/16	2 7/16	2 3/16	.....	25 1/16	8 19/32	3 1/2	1 1/2	...	3/4	....	....	....	....	....	....
	Mod. 65, 65L, 70, 70L, 90, 90L Hot Water								1 15/16	1 15/16	....	2 1/4	20 3/4	....	....	2 7/8	...	1 1/4	1 1/4	....	....	....	....	....	....
	Mod. 80, 80L Hot Water								....	1 15/16	1 15/16	2 1/2	.....	24 3/4	7 17/32	2 7/16	1 1/4	...	1 1/4	....	....	....	....	....	....

* Vary Slightly

GRINNELL COMPANY
INC.

EXECUTIVE OFFICES: PROVIDENCE, R. I., 260 West Exchange Street

Cable Address: "SPRINKLER, NEW YORK"

SALES OFFICES

ALBANY, N. Y., 11 North Pearl Street
ATLANTA, GA., 240 North Highland Avenue, N. E.
CHARLOTTE, N. C., 1431 West Morehead Street
CHICAGO, ILL., 4425 South Western Avenue
CLEVELAND, OHIO, 5201-3 Hamilton Avenue
DALLAS, TEXAS, 1315 Marilla Street
MINNEAPOLIS, MINN., 240 Seventh Avenue, South
NEW YORK, N. Y., *Executive Office,* 420 Lexington Avenue
Sales Offices and Warehouse, 23rd Street and 50th Avenue, Long Island City, N. Y.
PHILADELPHIA, PA., Erie Avenue and D Street
PROVIDENCE, R. I., 260 West Exchange Street
ROCHESTER, N. Y., 65 Broad Street
ST. LOUIS, MO., 1140 Central Industrial Avenue
ST. PAUL, MINN., 194 West Fourth Street
WARREN, OHIO, Dana and Paige Avenues

PLANTS

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